

Global Programs and Conventions: Coherence and Mutual Synergies from Holistic Information Management

Horst Kremers

CODATA-Germany
POB 200548, 13515 Berlin
Germany
office@horst-kremers.de

Abstract. The UN Declarations and other UN Instruments texts increasingly enforce the demands for coherence and mutual synergies. This paper describes the basic elements of coherence, consequences for holistic information management across programs and conventions and rises awareness on key issues information governance needed to foster of cross-domain and cross-organizational national as well as international implementations needed for timeliness support of societal, natural, technical, humanistic and ethical aspects for the future of people and planet.

Keywords. UN Declarations and Instruments, Coherence, Information Management, Coherence, Interoperability and Information Infrastructures, Decision Support, Applied Semiotics, Situation Dynamics, Standards, Governance, Inter-Organizational Complexity Management, Ontologies, Organizations and Stakeholder Groups, Synergy effects, Clearinghouses, Observatories, Testbeds, Cartography for Operability and Abstraction, Formal Models, Implementations, Runtime Environments, Big Data, New Approaches in sustainable Planning, Implementation and Protection, Data Availability, vs. Data Demand, Data Quality Issues, Data Sharing with the Private Sector (Industries, Business, Insurances etc.), Complex Data Visualization for Decision Support and Operations Control, Comparability Issues

1 Introduction

The requirements for coherence are defined in the texts of the core and neighboring UN Instruments (Transnational Declarations, Conventions, Treaties, Frameworks and Directives) : UN HABITAT, UN Sustainable Development Goals SDGs, UNDRR Sendai Framework on Disaster Risk Reduction, UN Framework Convention on Climate Change, International Platform on Biodiversity and Ecosystem Services IPBES, Human Rights, Children Rights, IPCC, UNDP, UN World Food Program, and many others.

2 Coherence

On the operational level, syntactic, semantic and pragmatic coherence (full semiotics coherence, that is on syntax, semantics and pragmatics level [PEIR], [MORR], [KRE06], [SCOT]) needs to be achieved on local, regional, national and international levels. We know about the benefits of processes in technical agreement on specifications and semantic meaning (“are we talking of the same or of different facts”) that also assist other levels of coherence to benefit from our technical diligence.

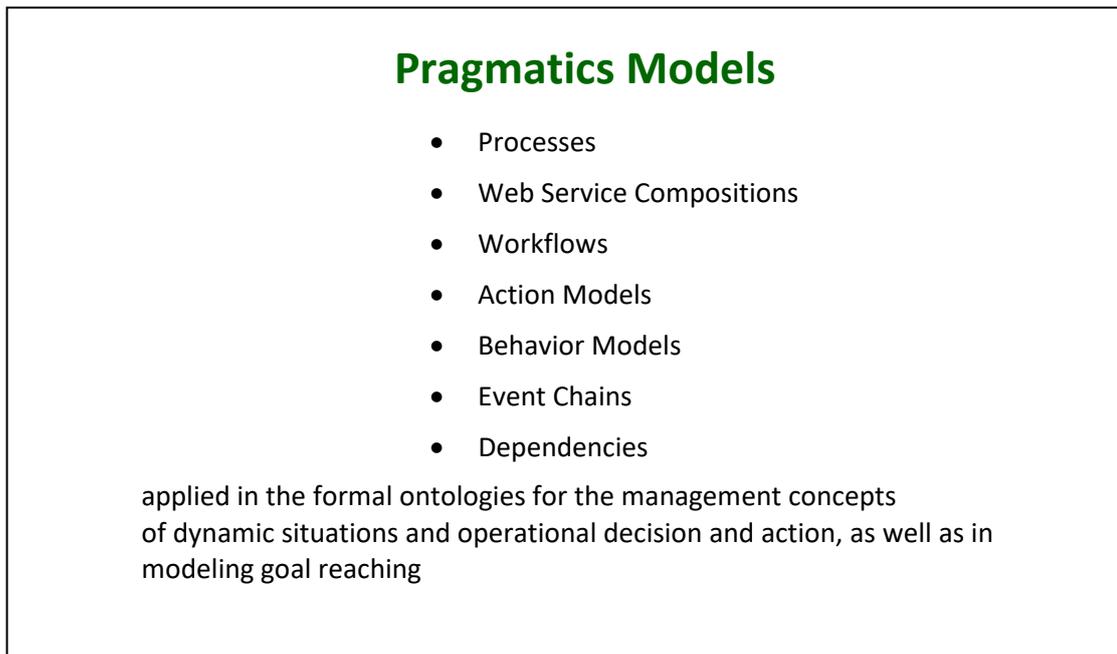


Fig. 1: Pragmatics Models

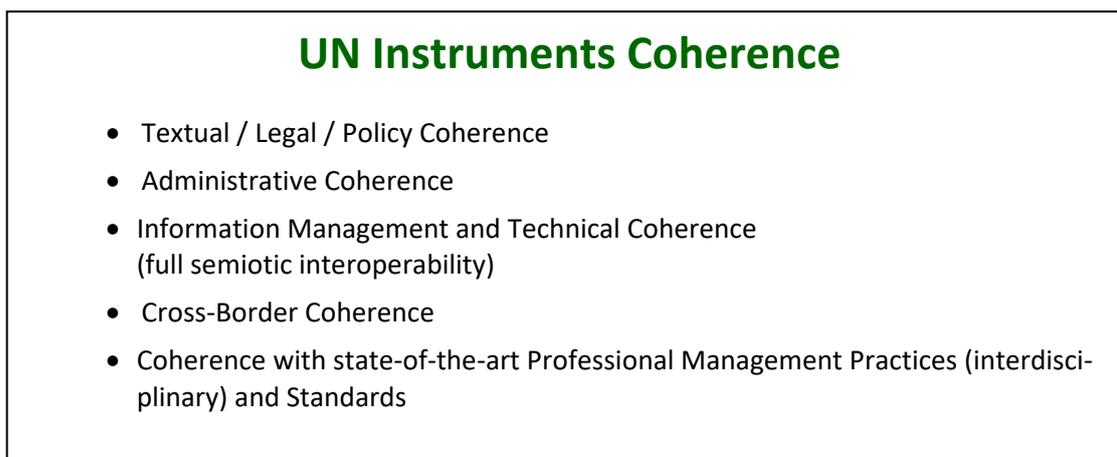


Fig. 2: Basic Domains/Types of Coherence

It would be more adequate if cross-organizational data demands for each of the specific requirements of the UN Instruments would soon find its adequate attention in comparison with the current statistics data discussions especially not only for operational but for strategic issues (indicators). The overlap between Geoinformation combined with Statistical Information and all the vast amount of data needed for operational management is marginal.

- Gaps in cross-organizational data availability, incompatible data quality and missing interoperability are well-known today to disable best possible decisions and services in all types of countries.
- The holistic view of Big Data availability and cross-organizational interoperability still needs to find adequate attention by UN Instruments Information Management Governance.

Initializing and implementing basic processes for cross-instrument information governance will start setting elementary boundary conditions (as required in the texts of UN instruments).

Besides the general way of procedure for accomplishing or approaching particular (selected) aims in a systematic way, much more attention should be devoted to all those situations, where suboptimal information management and, in consequence, avoidance of substantial deficits in natural, technical sustainability as well as in humanitarian disasters.

Future research and development in those areas will bring a significant contribution to all the cycle of sustainability analysis and the sustainability management areas only if the inherent complexity of interdisciplinary/cross-organizational data, data analytics, data transmission and use processes, and sophisticated ontology models for situation prediction along with consequences scenarios for all types of actors is based on standards and Information Infrastructure principles [BSD], [KOSO], [SOUS].

Infrastructure efforts are guided by joint commitment and requirements specifications of actor organizations (public administration, civil society and private sector). Transfer and adaption/extension of concepts that have been proofed adequate for large-scale information infrastructure realization are in due need for the corresponding elements of good governance [IGOB], [IGOV], [SMAL].

UN Instruments information in its complexity is in due need of very broad systematic integration, processing, evaluation and goal oriented applications of large amounts of data of heterogeneous origin in real time. Big Data offers the appropriate technology to integrate data from the various sources, to analyze it and to make it available for decision processes and operations support [LACH], [ZIEM].

Establishing Cross-Organizational Information Infrastructures

- Catalog of Information Sources Metainformation
- Improved Data Access (Time and Cost Savings)
- Enable and Improve Data Exchange between different Institutions and Application Domains
- Consistent and Efficient Use of Data
- More Efficient Development of Services using existing Data and Standards
- High-Quality Data for Action Alternatives and Decision-Making Support
- Service-Level-Agreements (Preparatory and Operational)
- Improvement of Strategic, Tactical and Operational Decisions
- Possibility of Decision-Making about Policies (Administration, Jurisdiction etc.)
- Including the Private Sector
- Facilitating the Development of Knowledge Generation, Communication and Comparison
- Comprehensive Documentation and holistic Ex-Post Analysis
- Analysis Across all Phases of Planning, Implementation, Operation and Control of Goal-Reaching Effects

Fig. 3: Establishing Cross-Organizational Information Infrastructures

Application of informatics state-of-the-art methods and technology that meet the demands of complex multi-actor and cross-organizational information management is urgently required for organizationally as well as technically implementing Treaties, Frameworks and Programs and for granting coherence in the required holistic way.

3 Information Governance Based on Management Principles

The complete set of management best practice methods especially supports the principles of “critical thinking”, enabling extensive reporting, transparent analysis, compliance to regulations and other boundary conditions, and constructive goal-reaching control [SMITH]. These control obligations include phases of retrace, audit, reexamination, analysis, avoidance of malpractice, and indications on weaknesses/vulnerabilities.

Some of the core management procedures listed (e.g. audits) have to be assigned to independent organizations mainly because of the general public interest of consequences in Information Management accountability [AA99] (following basic principles of European Court of Auditors [ECA]).

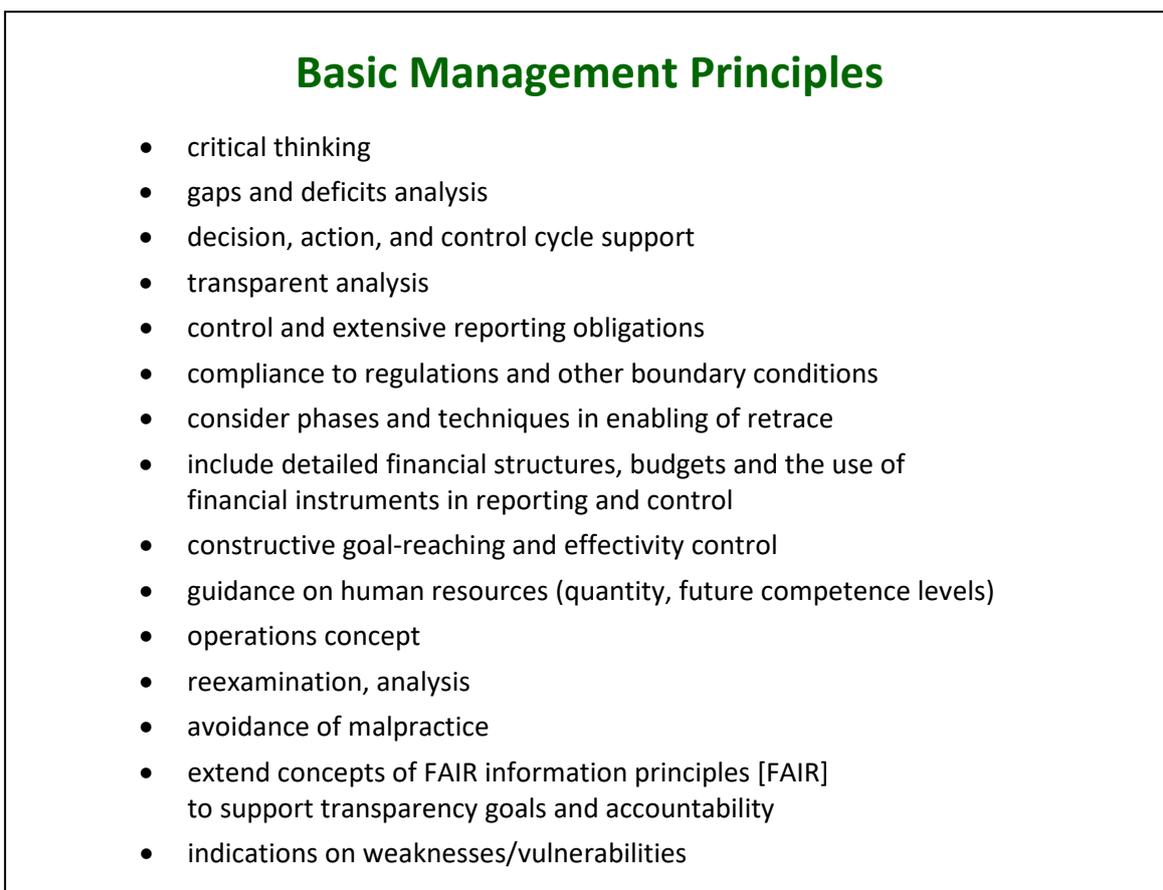


Fig. 4: Basic Management Principles

One of the major complex interdisciplinary aims to accomplish is the development and implementation of good praxis of cross-organizational information flows, including detailed documentation (including standards for cross-organizational information storage and persistent/long-time accessibility).

Besides multi-stakeholder inclusion and discussion in the development of strategies, implementing a concept of follow-up roadmap / action-plan is to be anticipated already in preparatory phases:

- negotiate for standards for situation/action phases definition
- make Information Management elements a prerequisite of comprehensive reporting (cf. [DIER], [COOP]) and (annual) National Reporting (National Focal Points for UN Instruments)
- specify a priori documentation requirements according to UN Instruments extensive requirements,
- enable content search by timestamp, time period, content or actor group involved (define information management elements in strong anticipation of information use)
- check with all stakeholders for potential fraud in decisions and actions in operation [LACH] as well as in administration, financial and private sector domains
- implement awareness on best practice ethical principles

3.1 Information Governance Domains for UN Instruments Implementation

The basic and most pervasive requirement of achieving coherence between UN Instruments can be achieved technically by establishing semiotic compatibility [KRE05], [KRE6], [LOLL] between information systems as well as integration of different data cultures.

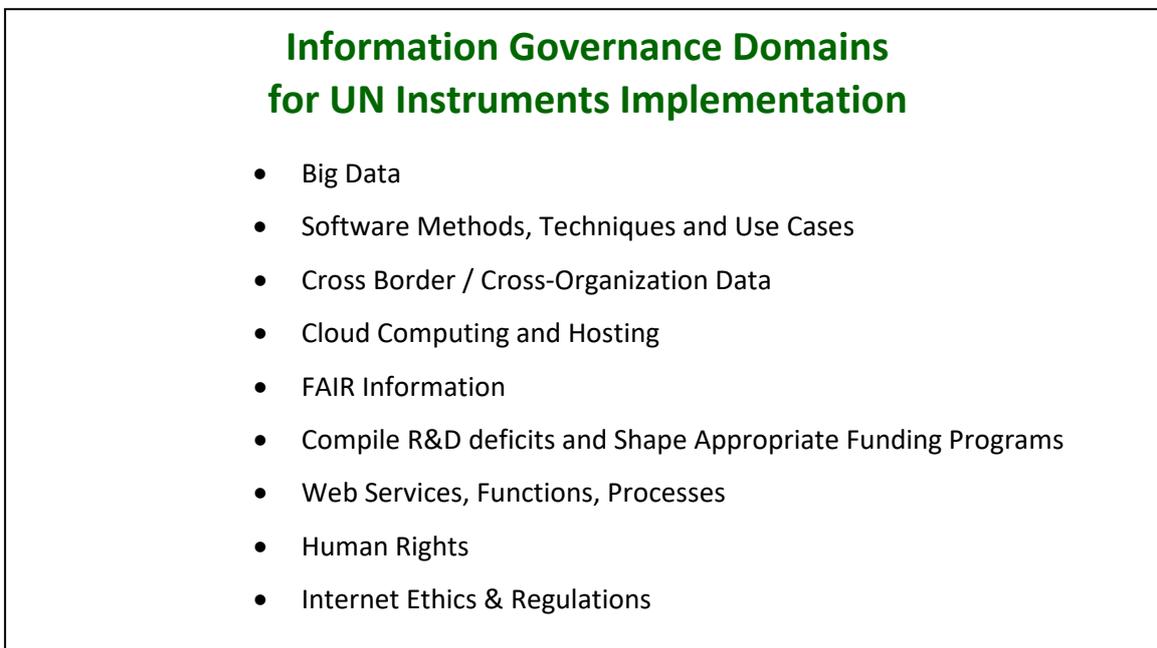


Fig.5: Information Governance Domains for UN Instruments Implementation

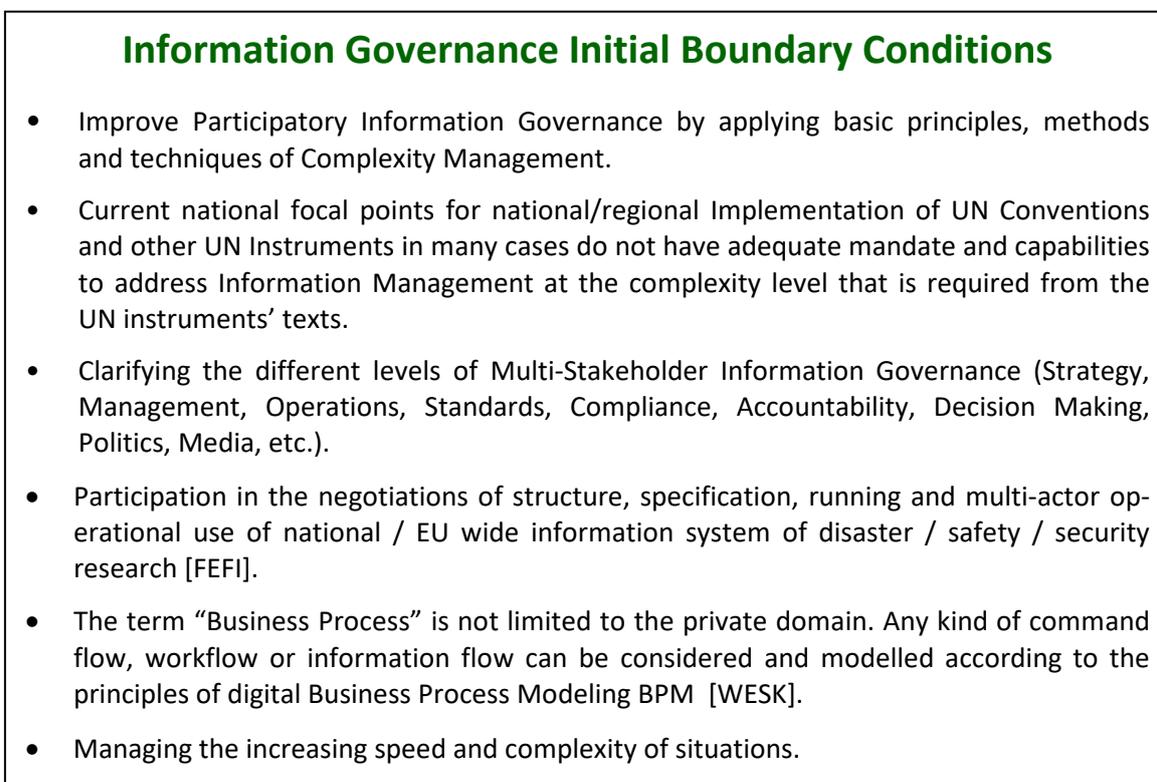


Fig. 6: Information Governance Initial Boundary Conditions

4 Challenges in Applied Informatics

In addition to current basic efforts in cross-instrument information coherence, future technical implementations have to clarify the decisions on choice and potential change of innovation levels as well as corresponding management methods and techniques in the fields of

- Cloud Computing and Hosting
- Situation Documentation
- Clearinghouses, Observatories, Testbeds
- Probabilistics, Fuzzy Knowledge, Error Propagation, Reliability
- Cartography for Operability and Abstraction
- Cultural Issues
- Formal Models, Implementations, Runtime Environments
- Synergy effects

Complex cross-domain information models typically comprise a large number of variables and complex dependencies of functional, analytical, and operational boundary conditions (resources, time, space, actions) [FARY], HEDE], [HL01], KOSO], [SOUS].

The appropriate complex model construct is situational [FARY]. Scenario techniques allow for the derivation of variations in decision alternatives and comparison of consequences [LACH].



Fig. 7: The Complexity Challenge

There are web-based scenario tools available that allow public users to vary facts and contexts for variation investigations, but it is not clear to what extent actors (being non-expert with regard to data and model) would be able to draw reliable information from such tools.

Information models underlying UN Instruments implementations must be communicated. The whole communication process requires substantially more investigation in order to become reliable and efficient enough to achieve the overall goal of better understanding, decision making, and action in cases of UN Instruments joint efforts for sustainability and humanitarian situation improvement.

Aggregates of certain parameters must be visualized in a more or less standard way (agreement on visual style and cartographic models) to prevent multi-actor and multicultural misunderstanding or misinterpretation.

Structural and algebraic properties have to be analyzed with respect to numerical / functional procedures of analysis may not be allowed within or between incompatible data subspaces.

Structural and Algebraic Properties of Data Spaces

- Dimensionality of those datasets that represent multiple models of the information spaces involved
- Conceptual differences in dimensionality of fact spaces dynamics in space and time
- Dimensionality refers to the degree of non-independence in the spatial or temporal variation among multiple measures
- Algebraic properties of data spaces (denseness, homogeneousness, isotropy, continuity, differentiability)
- Algebraic properties across different layers of abstraction
- Inverse problems

Fig. 8: Structural and Algebraic Properties of Data Spaces

4.1 Demands and Emerging Trends in Information Modeling and Analytics

Some of the demands of urgent innovation in information modeling and analytics are identified but lack information governance with respect to the complexity and very high interdisciplinarity of the Semantic Mapping problem space touched in this paper. One of the basic governance tasks is to create the appropriate management framework, implement the management framework, organize recursive control and give permanent guidance. This becomes especially evident in humanitarian support situations logistic support [CHON].

- The topic “Information Flow” was confirmed for need of much broader attention on all cross-UN-Instruments information management discussions and developments (all phases, all actors as well as law-enforcement agencies from local to global level)
- Currently there is insufficient (inadequate low) concern about intra-domain and cross-organizational logistics aspects
- “Logistics” is not limited to goods- and transport logistics. Cross-organizational / cross-domain logistics needs in humanitarian contexts comprise ensuring coordination, information management, and access to logistics services in all management as well as in operational tasks.
- Digital technologies are available but lack broad operational implementation. Strategic challenges from political and government domains (National/International Digital Agenda (e.g. [EIF], [DAE]), setting UN Data Revolution concept [REVO] into action etc.) have not yet been adequately checked and managed for operational implementation goals on national, international and global level.

- Command Support Systems: cross-level and cross-organizational integration is widely missing. Joint projects and development in the fields of civil-military cooperation can not only improve shared information processing but also raise awareness in the benefit of building on sound management principles [CONS], including prerequisite competences education and development especially for the huge variety of administrative / organizational public and private sector units involved.
- One of the fundamental prerequisite in support of information analytics, decision support and operational action is the uptake of details (bottom-up) to enhance semantic mapping (intra-domain and especially cross-domain / cross-domain and cross-organizational).

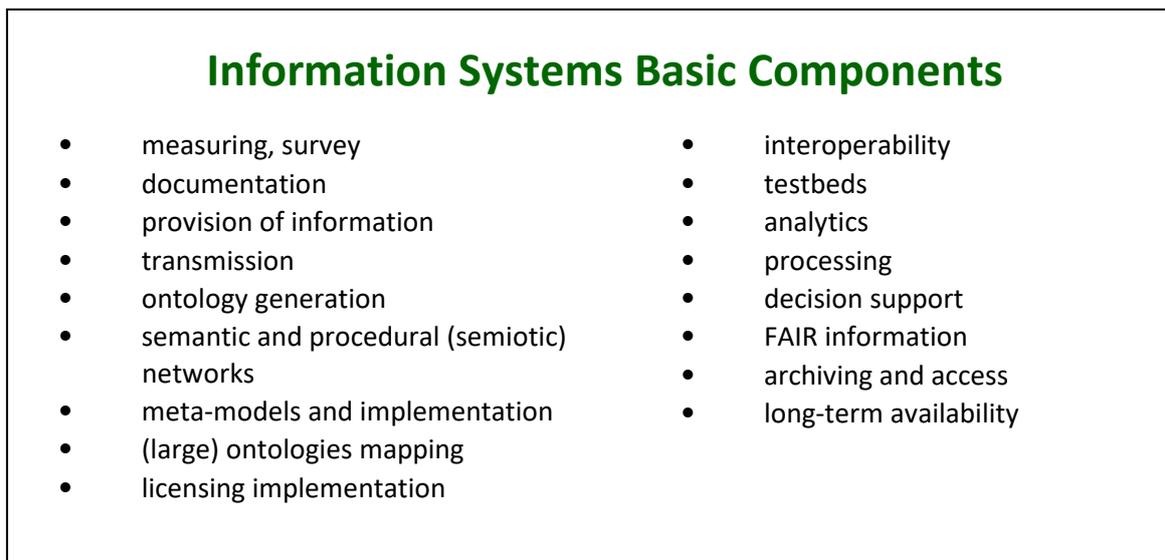


Fig. 9: Information Systems Basic Components

5 Recommendations and Urgency of Action in Terms of Information Governance

There are some key future demands in applying appropriate Information Management Principles for implementation of UN Conventions and other UN Instruments under requirements of coherence:

- The term “Coherence” needs to be treated in a really complex and scalable way.
- Private sector sensibility for benefits from joint preparedness, planning, implementation and protection of sustainable and humanitarian action operational guidance needs to be raised.
- “Accountability” / comprehensive Reporting needs to include financial transfers and use audit/control existing standard procedures.
- Documentation of liability risks (in anticipation and/or from practical experiences) enables fruitful discussions in all realization/implementation phases, all regional levels and between actor groups.
- Data privacy issues are of growing concern but can adequately be handled in the information systems specification, structure, design, implementation and operation.
- Current concepts of Science Data Information Infrastructure do not meet the various (full management) challenges of the complex structure of public sector and private sector organisations that since long time work on massive information on various levels of responsibility and obligation.

- Implementation of restrictions to information use and limitations of information validity / storage periods have to be considered from the start (holistic view guiding incremental implementation concepts), including appropriate formal ontological modeling, annotation and testbeds
- Information Governance is a process to be organized and implemented in a permanent, multi-stakeholder way. Information Governance coordination will essentially benefit from cooperation with National Focal Points for UN Instruments, especially in the domains of
 - a. Foster exchange on best practices across stakeholders/practitioners and increase public awareness. Exchanging views, building alliances, identifying problems in implementation and possible actions to address them. Making available to public and private organizations, the existing practical tools, testbeds and approaches, guidelines and criteria; offering the opportunity to frontrunners to share their experience, including on key issues such as transparency and traceability; contributing to the development of guidance for implementation.
 - b. Track progress, risks and opportunities, regularly taking stock of progress and reflecting on possible adjustments or additional measures to strengthen implementation and goal-reaching efforts.

The various levels of competences needed in organizations (especially in law enforcement agencies) as well as in guiding / reporting units (also including National Focal Points for UN Instruments) should be carefully considered and not be underestimated.

In terms of management there is also urgent need to estimate long-term consequences of current suboptimal information governance and coherence establishment with respect to regional/national/cross-national and global implementation of UN Conventions and other UN Instruments.

This it is mainly a challenging and creative task domain for practitioners and organizations in charge. Science partnership is essential in all phases.

It is Our Future: Multi-Stakeholder Governance guiding principles [COBA], structure, participation and practice for Implementation of Conventions and other Instruments is imperative. These efforts are not just for the operational demands of technicians and administrators, they are essential for Society at large.

References

- [AA99] Accountability: AccountAbility 1000 (AA1000) – accountability standard, focused on securing the quality of social and ethical accounting, auditing and reporting. Institute of Social and Ethical Accountability (1999) 28 p.,
<http://www.accountability.org/images/content/0/7/076/AA1000%20Overview.pdf>
- [BSD] Behrend, Andreas; Schmiegel, Philip; Dohr, Andreas: Supporting Situation Awareness in Spatio-Temporal Databases. *Datenbank Spektrum* 16 (2016) 207-218. Springer,
- [CHON] Chong, Mario; et al.: Goal programming optimization model under uncertainty and the critical areas characterization in humanitarian logistics management. *Journal of Humanitarian Logistics and Supply Chain Management* 9 (2019) (1) 82-107. Emerald, ISSN 2042-6747
- [CLOU] Cloutier, R.J.: Guide to the Systems Engineering Body of Knowledge - Information Management. (2017), https://www.wiki.org/w/index.php?title=Information_Management
- [COBA] Constantinides, Panos; Barrett, Michael: Information Infrastructure Development and Governance as Collective Action. *Information Systems Research* 26 (2014) Jan.17., DOI: 10.1287/isre.2014.0542
https://www.researchgate.net/publication/273130860_Information_Infrastructure_Development_and_Governance_as_Collective_Action

- [CONS] Consoli, Sergio; Stilianakis, Nikolaos: Operations research in disaster preparedness and response: The public health perspective. JRC Technical Report [EUR 25763 EN](#) (2013) 20 p., <https://publications.europa.eu/en/publication-detail/-/publication/8579c689-ff66-4c6e-b394-b9e57a4ae8dc>
- [COOP] Coopoe, Glenda: Reporting Humanitarian Disasters in a Social Media Age. Routledge Research in Journalism Series (2018) 252 p.. Routledge, ISBN 9781138483576
- [DAE] A Digital Agenda for Europe - Europe 2020 Strategy. Communication from the Commission to the European Parliament, the Council, the European Economic And Social Committee and the Committee of the Regions. COM(2010) 245 (2010) <https://www.kowi.de/Portaldata/2/Resources/fp/2010-com-digital-agenda.pdf>
- [DIER] Diers-Lawson, Audra: A State of Emergency in Crisis Communication an Intercultural Crisis Communication Research Agenda. Journal of Intercultural Communication Research 46 (2017) (1) Jan.54. Routledge, <https://doi.org/10.1080/17475759.2016.1262891>
- [ECA] Fostering trust through independent audit - The European Court of Auditors' Strategy for 2018-2020. (2017) <https://www.eca.europa.eu/> https://www.eca.europa.eu/Lists/ECADocuments/STRATEGY2018-2020/STRATEGY2018-2020_EN.PDF.pdf
- [EIF] EIF European Interoperability Framework – Implementation Strategy. Communication from the Commission to the European Parliament, the Council, the European Economic And Social Committee and the Committee of the Regions. COM(2017) 134 final (2017) http://eur-lex.europa.eu/resource.html?uri=cellar:2c2f2554-0faf-11e7-8a35-01aa75ed71a1.0017.02/DOC_1&format=PDF
- [FAIR] The Internet of FAIR Data & Services. <https://www.go-fair.org/resources/internet-fair-data-services/>
- [FARY] Faulconbridge, R. Ian; Ryan, Michael J.: Managing Complex Technical Projects: A Systems Engineering Approach. (2003) 255 p.. Artech House, ISBN 1-58053-378-7
- [FEFI] Fekete, Alexander; Fiedrich, Frank: Urban Disaster Resilience and Security - Addressing Risks in Societies. (2018). Springer International Publishing, 978-3-319-68605-9 <https://www.springerprofessional.de/urban-disaster-resilience-and-security/15281988>
- [HEDE] Hedelin, Beatrice: Complexity is no excuse. Introduction of a research model for turning sustainable development from theory into practice. Sustainability Science 14 (2019) 733–749. Springer, <https://doi.org/10.1007/s11625-018-0635-5>
- [HL01] Hanseth, Ole; Lyytinen, Kalle: Design theory for dynamic complexity in information infrastructures: The case of building internet. Journal of Information Technology 25 (2010) Jan.19. Palgrave, doi:10.1057/jit.2009.19
- [IGOB] Information Governance Annotated Bibliography, <http://bok.ahima.org/PdfView?oid=300425>
- [IGOV] Information: To share or not to share? The Information Governance Review. (2013), https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/192572/2900774_InfoGovernance_accv2.pdf
- [KOSO] Kovacic, Samuel F.; Sousa-Poza, Andres: Managing and Engineering in Complex Situations. Topics in Safety, Risk, Reliability and Quality (2013). Springer, 9789400755147
- [KRE05] Kremers, Horst: Generalization and Semiotics: The Way to Consistent Multilevel Decisions. Diskussionsbeitraege zur Kartosemiotik und zur Theorie der Kartographie 8 (2005) Jul.13
- [KRE06] Kremers, Horst: Generalization Principles in Applied Semiotics. ISGI 2005, Proceedings, International CODATA conference of Generalization of Information (2006) 191-204
- [LACH] Lachhab, M.; Et al.: Towards an Integration of Systems Engineering and Project Management - Processes for a Decision Aiding Purpose. IFAC PapersOnLine 50 (2017) 7266–7271. Elsevier, Doi 10.1016/j.ifacol.2017.08.1379

- [LOLL] Lolli, Fabrizio M.A.: Semantics and pragmatics in actual software applications and in web search engines - exploring innovations.. 10 pp.,
<https://arxiv.org/ftp/arxiv/papers/1307/1307.0087.pdf>
- [MORR] Morris, Charles W.: Foundation of the Theory of Signs. Mouton.,
- [PEIR] Peirce, Charles Sanders: Collected Papers (1931-1958). Harvard University Press,
- [REVO] A World that Counts - Mobilising the Data Revolution for Sustainable Development. (2014) 32 p.. UN IEAG, <http://www.undatarevolution.org/wp-content/uploads/2014/11/A-World-That-Counts.pdf>
- [SCOT] Scott, William T.: The Possibility of Communication. Approaches to Semiotics 87 (1990) Mouton de Gruyter, Berlin/New York. SBB 1 A 50 595,
- [SETO] Setola, Roberto; et al.: Managing the Complexity of Critical Infrastructures. Studies in Systems, Decision and Control 90 (2016) 300. Springer, ISBN 978-3-319-51042-2, ISBN 978-3-319-51043-9 (eBook), DOI 10.1007/978-3-319-51043-9
<https://link.springer.com/content/pdf/10.1007%2F978-3-319-51043-9.pdf>
- [SMAL] Smallwood, Robert F.: Information Governance: Concepts, Strategies, and Best Practices. (2014) 464 p. Wiley, ISBN 1118218302
- [SMITH] Smith, Mike: Fundamentals of Management. 2nd ed. (2011) McGraw-Hill Education, ISBN-13 9780-07-712693-3
- [SOUS] Sousa-Poza, Andres: A Narrative of [Complex] Situations and Situations Theory. Topics in Safety, Risk, Reliability and Quality 21 (2012). Springer, ISSN (Print) 15660443
- [WESK] Weske, Mathias: Business Process Management: Concepts, Languages, Architectures. 3rd Ed. (2019) 417 p. Springer Verlag, ISBN 978-3-642-28615-5
- [ZIEM] Ziemann, Jörg: Architecture of Interoperable Information Systems - An enterprise Model-Based Approach for Describing and Enacting Collaborative Business Processes. (2010) 298 p.. Logos Verlag, 978-3832524142